UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/601,234	06/20/2003	Olivia R. West	0958.1	9176

51179 7590 08/23/2006

ROBERT J. LAUF
998 WEST OUTER DRIVE
OAK RIDGE, TN 37830

EXAMINER	
STADLER, REBECCA M	

ART UNIT	PAPER NUMBER
1754	

DATE MAILED: 08/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/601,234	Applicant(s) WEST ET AL.
	Examiner Rebecca M. Stadler	Art Unit 1754

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *02 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 June 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The limitation of "while providing sufficient lateral restraint to consolidate said particles into a substantially solid extruded body" is not supported by the specification. In particular, the solid extruded body is not supported. Figure 1 does not appear to depict a process that results in a substantially solid extruded body, nor does it clearly depict that the packing density of the stream increases as the mixture travels along the reactor. As the hydrate forming fluid enters the reactor it is in particulate form, but it appears that as soon as the water enters the hydrate, the packing density instantly increases and then is constant from that point until it exits. As the packing density appears to be constant from the point of water injection to the end, there is nothing in the diagram that supports a process for producing a substantially solid extruded body.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a.) Claim 1 is unclear insofar as it cannot be determined what would meet the limitation of a "substantially solid extruded body."

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 2, 4, 6, 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over USP 5,364,611 to Iijima in view of USP 6,531,034 to Max.

As to claim 1, Iijima '611 discloses a method for producing a hydrate comprising the steps of: delivering CO_2 (a hydrate-forming species) to a pressurized, temperature controlled,

continuous flow-reactor (see Abstract, lines 1-5 and lines 5-8 and column 6, lines 21-23 for "continuous"); injecting water into the hydrate-forming species (see column 10, lines 41-45); and mixing the CO_2 with the water in the reactor until a hydrate is formed (see column 2, lines 39-41).

Iijima '611 does not disclose whether the flow is turbulent or laminar. However, ' 034 discloses that hydrate formation can be enhanced by creating turbulent flow conditions (see column 8, lines 26-29). Therefore, it would have been obvious to one of ordinary skill in the art at the time of this invention to create turbulent flow conditions in the process of Iijima in order to enhance the hydrate formation so as to ensure that the hydrate effectively sinks to the bottom of the ocean (see abstract of Iijima lines 5-6). Finally, claim 1 requires that the emulsion flows through the reactor "for a sufficient time to allow solid gas hydrate particles to form while providing sufficient lateral restraint to consolidate said particles into a substantially solid extruded body." Iijima does not use quite the same language to describe the product that it delivers to the bottom of the ocean. However, the Iijima product carbon dioxide hydrate is a solid (see column 10, lines 49-50 and column 11, lines 17-18). In figure 7, the product is labeled as numeral 209 and the outlet is labeled as numeral 206. Insofar as currently amended claim 1 requires an extrusion step, the reactor of Figure 7 will provide the lateral restraint and Iijima indicates that its product is a solid. If Figure 1 of the present application depicts an extrusion process, then Figure 7 of Iijima also depicts extrusion. Finally, the process of Iijima in view of Max is the same as that claimed in the present invention. Therefore, the Iijima in view of Max process will form the same "substantially solid extruded body" product.

As to claim 2, the method of Iijima '611 teaches that the reactor is a pipe (see column 2, lines 39-42) having water injected into the pipe (see column 8, lines 61-65) and the carbon dioxide hydrate product is discharged from the reactor (see column 2, lines 46-47).

As to claim 4, the Iijima '611 provides a means for controlling the flow rate of carbon dioxide and water (see column 11, lines 2-4, which discuss flow rates thereby implying that a

means for control rate is provided). The Iijima patent also discloses both a temperature and pressure control means (see Figure 10 and column 11, lines 50-55).

As to claim 6, Iijima '611 discloses a pump (for water) with a flow controller (see Figure 6 and column 9, lines 18-21 and lines 28-31, wherein the pump itself serves as the flow controller).

As to claim 9, Iijima '611 discloses a driven propeller used to mix the carbon dioxide and water (see column 12, lines 13-17). As this propeller has blades and is driven, presumably by electrical power, for mixing, it meets all of the limitations of the claimed "electrically powered mixing blades."

As to claim 10, the Iijima '611 process uses CO_2 as the hydrate-forming fluid (see abstract lines 1-5). Iijima suggests using liquid carbon dioxide because it has a larger specific gravity than seawater, which will ensure that the carbon dioxide sinks (see column 1, line 66 – column 2, line 2). Ultimately, the Iijima in view of Max process will form a "monolithic compact comprising CO_2-hydrate/CO_2-liquid, and water" because the process is the same as the present process.

Claims 1, 2, 4, 6, 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over USP 5,562,891 to Spencer in view of Max '034

As to claim 1, Spencer '891 teaches a method for producing hydrates, which comprises the steps of: delivering CO_2 to a pressurized, temperature-controlled, continuous-flow reactor (see Abstract lines 1-14 and column 5, lines 52-54 and see column 2, lines 46-59 demonstrating that the reactor is able to control the temperature); delivering water to the reactor (see column 6, lines 21-23); and producing a carbon dioxide hydrate (see column 2, lines 46-47)..

Spencer '891 does not disclose whether the flow is turbulent or laminar. However, ' 034 discloses that hydrate formation can be enhanced by creating turbulent flow conditions (see column 8, lines 26-29). Therefore, it would have been obvious to one of ordinary skill in the art at the time of this invention to create turbulent flow conditions in the process of Spencer in order

to enhance the hydrate formation so as to ensure that the hydrate effectively sinks to the bottom of the ocean (see abstract of Spencer lines 9-14). Finally, claim 1 requires that the emulsion flows through the reactor "for a sufficient time to allow solid gas hydrate particles to form while providing sufficient lateral restraint to consolidate said particles into a substantially solid extruded body." Spencer does not use quite the same language to describe the product that it delivers to the bottom of the ocean. However, the Spencer product carbon dioxide hydrate can be released as a solid into the ocean (see column 6, line 44-47). Finally, the process of Spencer in view of Max is the same as that claimed in the present invention. Therefore, the Spencer in view of Max process will form the same "substantially solid extruded body" product.

As to claim 2, the Spencer '891 reactor is a cylinder (see column 5, line 55). Further, Spencer '891 provides for removal of the hydrates through a conduit (see column 6, lines 2-3).

As to claim 4, Spencer '891 provides a means for: controlling the carbon dioxide (see column 6, lines 10-12, wherein the conduit and compressor control the flow); controlling the water flow (see column 6, lines 21-23, wherein the pump controls the flow of water); controlling the temperature (see column 6, lines 27-32, wherein the refrigeration unit controls the temperature); and controlling the pressure (see column 6, lines 12-15, wherein the compressors control the pressure).

As to claim 6, Spencer '891 teaches a pump for water (see column 6, lines 21-24, wherein the pump itself is the flow controller).

As to claim 9, Spencer '891 provides an agitation means (see column 5, lines 63-65), which appears to be a set of blades (see Figure 3), presumably the agitation means is electrically powered. Further, the "hydrate precursor" of Spencer '891 contains water as discussed in the Abstract. As such, Spencer '891 discloses the claimed "electrically powered mixing blades" for mixing the hydrate forming species and water.

As to claim 10, the Spencer '891 process uses gas or liquid CO_2 as the hydrate-forming fluid (see column 2, lines 46-51). Ultimately, the Spencer in view of Max process will form a

"monolithic compact comprising CO_2-hydrate/CO_2-liquid, and water" because the process is the same as the present process.

As to claim 11, Spencer '891 discloses a process for producing a hydrate-containing material (see abstract, line 1), comprising the steps of: flowing water through a continuous-flow reactor to a pressurized, temperature-controlled, continuous-flow reactor and injecting carbon dioxide into the reactor (see Abstract lines 1-14 and column 5, lines 52-54 and see column 2, lines 46-59 demonstrating that the reactor is able to control the temperature, see also column 3, lines 28-34).

Spencer '891 does not disclose whether the flow is turbulent or laminar. However, ' 034 discloses that hydrate formation can be enhanced by creating turbulent flow conditions (see column 8, lines 26-29). Therefore, it would have been obvious to one of ordinary skill in the art at the time of this invention to create turbulent flow conditions in the process of Spencer in order to enhance the hydrate formation so as to ensure that the hydrate effectively sinks to the bottom of the ocean (see abstract of Spencer lines 9-14). Finally, claim 11 requires that the emulsion flows through the reactor "for a sufficient time to allow solid gas hydrate particles to form while providing sufficient lateral restraint to consolidate said particles into a substantially solid extruded body." Spencer does not use quite the same language to describe the product that it delivers to the bottom of the ocean. However, the Spencer product carbon dioxide hydrate can be released as a solid into the ocean (see column 6, line 44-47). Finally, the process of Spencer in view of Max is the same as that claimed in the present invention. Therefore, the Spencer in view of Max process will form the same "substantially solid extruded body" product.

Claims 3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iijima '611 taken with Max '034 as applied to claims 1 and 4 above, and further in view of USP 5,738,762 to Ohsol.

As to claims 3 and 8, Iijima '611 does provide for adequate mixing of the carbon dioxide and the water, although the reference does not disclose the use of baffles. However, Ohsol

'762 does use baffles for mixing in its process (see column 4, lines 39-43). It would have been obvious to one of ordinary skill in the art at the time of this invention to use baffles in order to adequately mix the carbon dioxide and the water, while minimizing system complexity.

Claims 3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over '891 Spencer taken with Max '034 as applied to claims 1 and 4 above, and further in view of Ohsol '762.

As to claims 3 and 8, Spencer '891 does provide for adequate mixing of the carbon dioxide and the water, although the reference does not disclose the use of baffles. However, Ohsol '762 does use baffles for mixing in its process (see column 4, lines 39-43). It would have been obvious to one of ordinary skill in the art at the time of this invention to use static mixer blades in order to adequately mix the carbon dioxide and the water, while minimizing system complexity.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iijima '611 taken with Max '034 as applied to claims 1 and 4 above, and further in view of USP 4,913,886 to Satek.

As to claim 5, Iijima '611 does not disclose the use of a mass flow controller to control the flow of carbon dioxide. Satek '886 does use a mass flow controller to control the flow of the feed mixture (see column 15, lines 1-2). It would have been obvious to one of ordinary skill in the art at the time of this invention to add the mass flow controller of Satek '866 to the Iijima in view of Max method in order to more precisely control the flow rate to the process for better overall quality.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Spencer '891 taken with Max '034 as applied to claims 1 and 4 above, and further in view of Satek 4,913,886.

As to claim 5, Spencer '891 does not disclose the use of a mass flow controller to control the flow of carbon dioxide. Satek '886 does use a mass flow controller to control the flow of the feed mixture (see column 15, lines 1-2). It would have been obvious to one of ordinary skill in the art at the time of this invention to add the mass flow controller of Satek '866 to the Spencer in view of Max method in order to more precisely control the flow rate to the process for better overall quality.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iijima '611 taken with Max '034 as applied to claims 1 and 4 above, and further in view of USP 5,426,137 To Allen.

As to claim 7, Iijima '611 does not disclose a jet pump to control the water flow. However, Allen '137 does disclose the use of a jet pump in a similar method. It would have been obvious to one of ordinary skill in the art at the time of this invention to use the jet pump of Allen '137 in place of the regular pump of Iijima '611 in order to provide for additional mixing. As discussed in Allen '137, a jet pump "contributes to the mixing of water with the mixture because of the high energy at which the jet pump injects water into the mixture (see col. 14, lines 50-53).

Claim 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spencer '891 taken with Max '034 as applied to claims 1 and 4 above, and further in view of Allen '137.

As to claim 7, Spencer '891 does not disclose a jet pump to control the water flow. However, Allen '137 does disclose the use of a jet pump in a similar method. It would have been obvious to one of ordinary skill in the art at the time of this invention to use the jet pump of Allen '137 in place of the regular pump of Spencer '891 in order to provide for additional mixing.

Upon cancellation of the new matter, the following grounds of rejection would apply.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 2, 4, 6, 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over USP 5,364,611 to Iijima in view of USP 6,531,034 to Max.

As to claim 1, Iijima '611 discloses a method for producing a hydrate comprising the steps of: delivering CO_2 (a hydrate-forming species) to a pressurized, temperature controlled,

continuous flow-reactor (see Abstract, lines 1-5 and lines 5-8 and column 6, lines 21-23 for "continuous"); injecting water into the hydrate-forming species (see column 10, lines 41-45); and mixing the CO_2 with the water in the reactor until a hydrate is formed (see column 2, lines 39-41).

Iijima '611 does not disclose whether the flow is turbulent or laminar. However, ' 034 discloses that hydrate formation can be enhanced by creating turbulent flow conditions (see column 8, lines 26-29). Therefore, it would have been obvious to one of ordinary skill in the art at the time of this invention to create turbulent flow conditions in the process of Iijima in order to enhance the hydrate formation so as to ensure that the hydrate effectively sinks to the bottom of the ocean (see abstract of Iijima lines 5-6). Finally, claim 1 requires that a "consolidated solid-like hydrate/fluid/water" stream is formed. Iijima does not use the same language to describe the product that it delivers to the bottom of the ocean. However, the product of Iijima has negative buoyancy, as evinced by its description of the hydrate as something that will sink to the bottom of the ocean (see abstract, lines 5-6). The product of the present invention also possess negative buoyancy (see specification page 10, lines 1-2). This demonstrates that the product of Iijima meets the limitation of a "consolidated solid-like hydrate/fluid/water" stream being formed. Further, the process of Iijima in view of Max is the same as that claimed in the present invention. Therefore, the Iijima in view of Max process will form the same "consolidated solid-like hydrate/fluid/water" stream product.

As to claim 2, the method of Iijima '611 teaches that the reactor is a pipe (see column 2, lines 39-42) having water injected into the pipe (see column 8, lines 61-65) and the carbon dioxide hydrate product is discharged from the reactor (see column 2, lines 46-47).

As to claim 4, the Iijima '611 provides a means for controlling the flow rate of carbon dioxide and water (see column 11, lines 2-4, which discuss flow rates thereby implying that a means for control rate is provided). The Iijima patent also discloses both a temperature and pressure control means (see Figure 10 and column 11, lines 50-55).

As to claim 6, Iijima '611 discloses a pump (for water) with a flow controller (see Figure 6 and column 9, lines 18-21 and lines 28-31, wherein the pump itself serves as the flow controller).

As to claim 9, Iijima '611 discloses a driven propeller used to mix the carbon dioxide and water (see column 12, lines 13-17). As this propeller has blades and is driven, presumably by electrical power, for mixing, it meets all of the limitations of the claimed "electrically powered mixing blades."

As to claim 10, the Iijima '611 process uses CO_2 as the hydrate-forming fluid (see abstract lines 1-5). Iijima suggests using liquid carbon dioxide because it has a larger specific gravity than seawater, which will ensure that the carbon dioxide sinks (see column 1, line 66 – column 2, line 2). Ultimately, the Iijima in view of Max process will form a "consolidated CO_2-hydrate/CO_2-liquid/water" because the process is the same as the present process.

Claims 1, 2, 4, 6, 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over USP 5,562,891 to Spencer in view of Max '034

As to claim 1, Spencer '891 teaches a method for producing hydrates, which comprises the steps of: delivering CO_2 to a pressurized, temperature-controlled, continuous-flow reactor (see Abstract lines 1-14 and column 5, lines 52-54 and see column 2, lines 46-59 demonstrating that the reactor is able to control the temperature); delivering water to the reactor (see column 6, lines 21-23); and producing a carbon dioxide hydrate (see column 2, lines 46-47).

Spencer '891 does not disclose whether the flow is turbulent or laminar. However, ' 034 discloses that hydrate formation can be enhanced by creating turbulent flow conditions (see column 8, lines 26-29). Therefore, it would have been obvious to one of ordinary skill in the art at the time of this invention to create turbulent flow conditions in the process of Spencer in order to enhance the hydrate formation so as to ensure that the hydrate effectively sinks to the bottom of the ocean (see abstract of Spencer lines 9-14). Finally, claim 1 requires that a "consolidated solid-like hydrate/fluid/water" stream is formed. Spencer does not use the same language to

describe the product that it delivers to the bottom of the ocean. However, the product of Spencer has negative buoyancy, as evinced by its description of the hydrate as something that will sink to the bottom of the ocean (see column 2, lines 6-13). The product of the present invention also possess negative buoyancy (see specification page 10, lines 1-2). This demonstrates that the product of Spencer meets the limitation of a "consolidated solid-like hydrate/fluid/water" stream being formed. Further, the process of Spencer in view of Max is the same as that claimed in the present invention. Therefore, the Spencer in view of Max process will form the same "consolidated solid-like hydrate/fluid/water" stream product.

As to claim 2, the Spencer '891 reactor is a cylinder (see column 5, line 55). Further, Spencer '891 provides for removal of the hydrates through a conduit (see column 6, lines 2-3).

As to claim 4, Spencer '891 provides a means for: controlling the carbon dioxide (see column 6, lines 10-12, wherein the conduit and compressor control the flow); controlling the water flow (see column 6, lines 21-23, wherein the pump controls the flow of water); controlling the temperature (see column 6, lines 27-32, wherein the refrigeration unit controls the temperature); and controlling the pressure (see column 6, lines 12-15, wherein the compressors control the pressure).

As to claim 6, Spencer '891 teaches a pump for water (see column 6, lines 21-24, wherein the pump itself is the flow controller).

As to claim 9, Spencer '891 provides an agitation means (see column 5, lines 63-65), which appears to be a set of blades (see Figure 3), presumably the agitation means is electrically powered. Further, the "hydrate precursor" of Spencer '891 contains water as discussed in the Abstract. As such, Spencer '891 discloses the claimed "electrically powered mixing blades" for mixing the hydrate forming species and water.

As to claim 10, the Spencer '891 process uses gas or liquid CO_2 as the hydrate-forming fluid (see column 2, lines 46-51). Ultimately, the Spencer in view of Max process will form a "consolidated CO_2-hydrate/CO_2-liquid/water" because the process is the same as the present process.

As to claim 11, Spencer '891 discloses a process for producing a hydrate-containing material (see abstract, line 1), comprising the steps of: flowing water through a continuous-flow reactor to a pressurized, temperature-controlled, continuous-flow reactor and injecting carbon dioxide into the reactor (see Abstract lines 1-14 and column 5, lines 52-54 and see column 2, lines 46-59 demonstrating that the reactor is able to control the temperature, see also column 3, lines 28-34).

Spencer '891 does not disclose whether the flow is turbulent or laminar. However, ' 034 discloses that hydrate formation can be enhanced by creating turbulent flow conditions (see column 8, lines 26-29). Therefore, it would have been obvious to one of ordinary skill in the art at the time of this invention to create turbulent flow conditions in the process of Spencer in order to enhance the hydrate formation so as to ensure that the hydrate effectively sinks to the bottom of the ocean (see abstract of Spencer lines 9-14). Finally, claim 1 requires that a "consolidated solid-like hydrate/fluid/water" stream is formed. Spencer does not use the same language to describe the product that it delivers to the bottom of the ocean. However, the product of Spencer has negative buoyancy, as evinced by its description of the hydrate as something that will sink to the bottom of the ocean (see column 2, lines 6-13). The product of the present invention also possess negative buoyancy (see specification page 10, lines 1-2). This demonstrates that the product of Spencer meets the limitation of a "consolidated solid-like hydrate/fluid/water" stream being formed. Further, the process of Spencer in view of Max is the same as that claimed in the present invention. Therefore, the Spencer in view of Max process will form the same "consolidated solid-like hydrate/fluid/water" stream product.

Claims 3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iijima '611 taken with Max '034 as applied to claims 1 and 4 above, and further in view of USP 5,738,762 to Ohsol.

As to claims 3 and 8, Iijima '611 does provide for adequate mixing of the carbon dioxide and the water, although the reference does not disclose the use of baffles. However, Ohsol

'762 does use baffles for mixing in its process (see column 4, lines 39-43). It would have been obvious to one of ordinary skill in the art at the time of this invention to use baffles in order to adequately mix the carbon dioxide and the water, while minimizing system complexity.

Claims 3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over '891 Spencer taken with Max '034 as applied to claims 1 and 4 above, and further in view of Ohsol '762.

As to claims 3 and 8, Spencer '891 does provide for adequate mixing of the carbon dioxide and the water, although the reference does not disclose the use of baffles. However, Ohsol '762 does use baffles for mixing in its process (see column 4, lines 39-43). It would have been obvious to one of ordinary skill in the art at the time of this invention to use static mixer blades in order to adequately mix the carbon dioxide and the water, while minimizing system complexity.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iijima '611 taken with Max '034 as applied to claims 1 and 4 above, and further in view of USP 4,913,886 to Satek.

As to claim 5, Iijima '611 does not disclose the use of a mass flow controller to control the flow of carbon dioxide. Satek '886 does use a mass flow controller to control the flow of the feed mixture (see column 15, lines 1-2). It would have been obvious to one of ordinary skill in the art at the time of this invention to add the mass flow controller of Satek '866 to the Iijima in view of Max method in order to more precisely control the flow rate to the process for better overall quality.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Spencer '891 taken with Max '034 as applied to claims 1 and 4 above, and further in view of Satek 4,913,886.

As to claim 5, Spencer '891 does not disclose the use of a mass flow controller to control the flow of carbon dioxide. Satek '886 does use a mass flow controller to control the flow of the feed mixture (see column 15, lines 1-2). It would have been obvious to one of ordinary skill in the art at the time of this invention to add the mass flow controller of Satek '866 to the Spencer in view of Max method in order to more precisely control the flow rate to the process for better overall quality.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iijima '611 taken with Max '034 as applied to claims 1 and 4 above, and further in view of USP 5,426,137 To Allen.

As to claim 7, Iijima '611 does not disclose a jet pump to control the water flow. However, Allen '137 does disclose the use of a jet pump in a similar method. It would have been obvious to one of ordinary skill in the art at the time of this invention to use the jet pump of Allen '137 in place of the regular pump of Iijima '611 in order to provide for additional mixing. As discussed in Allen '137, a jet pump "contributes to the mixing of water with the mixture because of the high energy at which the jet pump injects water into the mixture (see col. 14, lines 50-53).

Claim 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spencer '891 taken with Max '034 as applied to claims 1 and 4 above, and further in view of Allen '137.

As to claim 7, Spencer '891 does not disclose a jet pump to control the water flow. However, Allen '137 does disclose the use of a jet pump in a similar method. It would have been obvious to one of ordinary skill in the art at the time of this invention to use the jet pump of Allen '137 in place of the regular pump of Spencer '891 in order to provide for additional mixing.

Response to Arguments

Applicant's arguments filed 06/02/2006 have been fully considered but they are not persuasive.

Applicant argues that the level of consolidation of the prior art and present invention products is different. While the Examiner agrees that the analogy of snowflakes and snowballs is helpful, there is no evidence that the prior art and the present invention are not both providing "snowballs." As explained above, both Iijima and Spencer are producing solid carbon dioxide hydrates. Applicant has not provided any evidence (i.e. actual packing density values) to show the degree of consolidation of the prior art as contrasted with the present invention.

Regarding applicant's argument that the prior art does not provide sufficient lateral restraint to consolidate the particles into a substantially monolithic extruded body, the prior art depicts similar reactor tubes, which would inherently provide sufficient lateral restraint.

Regarding the argument that Figures 7 and 8 depict a particulate hydrate rather than a solid extrusion, the description at column 10, line 36 – column 11, line 32 does not actually describe discharging isolated particles or flakes. Figures 10 and 11 were not relied on in the rejection.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See e.g., In re Fine, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596 (Fed. Cir. 1988), and In re Jones, 958 F.2d 347, 21 U.S.P.Q. 2d 1941 (Fed. Cir. 1992). In this case, the prior art was relied upon to show old and known methods for mixing. The primary references all desired thorough mixing. Therefore, one of ordinary skill in the art would be motivated to look to any known mixing technique to provide for thorough mixing.

Regarding applicant's argument that in some instances Spencer pumps the hydrate as a 50:50 clathrate-water slurry, Spencer teaches both a solid and a clathrate slurry. The prior art was relied upon for it's teaching that the hydrates will be released as solids.

As to the declaration, the argument that Figure 1 illustrates a lower spatial density of the individual hydrate particles when they are first forming, the drawing cannot be relied upon to establish density. First, the Examiner disagrees that this spatial density is illustrated, and second, even if it were illustrated in the diagram, there is nothing in the diagram to suggest that it accurately depicts the spatial density.

The Examiner further reiterates that there is no basis in the art to distinguish one hydrate from another on the basis of "consolidation." This problem is not resolved by the declaration. At what density does the hydrate become "consolidated?"

Regarding the declarations contention that buoyancy does not prove whether or not a particular product is solid, the Examiner did not use buoyancy to demonstrate that the hydrate was solid, this is especially true because the prior claim did not claim a solid. The Examiner pointed to the fact that both the prior art carbon dioxide hydrate and the present invention carbon dioxide hydrate had negative buoyancy as evidence tending to show that both products were similar.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rebecca M. Stadler whose telephone number is 571-272-5956.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

rms

COLLEEN P. COOKE
PRIMARY EXAMINER